Amendments to the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1-74. (Previously Cancelled)

75. (Currently Amended) An apparatus for down-converting an electromagnetic signal, comprising:

a capacitor having a first and second port;

a ~~switching device~~ transistor having a ~~first, second, and third port~~ source, gate and drain; and

a resonant structure having a first and second port,

wherein the first port of the capacitor is electrically coupled to one of the ~~second port~~ source or drain of the ~~switching device~~ transistor, and the first port of the resonant structure is electrically coupled to the ~~first port~~ other of the source or drain of the ~~switching device~~ transistor, ~~and~~

wherein a control signal is electrically coupled to the ~~third port~~ gate of the ~~switching device~~ transistor, and an RF source signal is electrically coupled to the first port of the resonant structure, and

wherein a signal frequency at the first port of the capacitor is lower than a frequency of the RF source signal.

76. (Currently Amended) The apparatus of claim 75, wherein a value of capacitance for the capacitor is selected so that the capacitor discharges stored energy to a load when the ~~switching device~~ transistor is open.

77. (Currently Amended) The apparatus of claim 75, wherein a value of capacitance (C_s) for the capacitor is selected based on a frequency (*freqLO*) of energy transfer pulses, a duration (*Aperture_Width*) of an aperture of the ~~switching device~~ transistor, and a resistance (R) such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture\_Width}{-\ln(0.841) \cdot R} \right).$$

78. (Currently Amended) The apparatus of claim 75, wherein a duration of an aperture of pulses of the control signal is nominally equal to one-half of a period of the ~~electromagnetic signal~~ RF source signal.

79. (Previously Presented) The apparatus of claim 75, wherein the first port of the capacitor is electrically coupled to an impedance matching network.

80. (Previously Presented) The apparatus of claim 75, wherein the first port of the capacitor is electrically coupled to an amplifier.

81. (Previously Presented) The apparatus of claim 75, wherein the first port of the resonant structure is electrically coupled to an impedance matching network.

82. (Cancelled)

83. (Currently Amended) The apparatus of claim 75, wherein the ~~switching device~~ transistor is a FET.

84. (Currently Amended) The apparatus of claim 75, wherein the ~~switching device~~ transistor is a JFET.

85. (Currently Amended) The apparatus of claim 75, wherein the ~~switching device~~ transistor is a MOSFET.

86. (Currently Amended) An apparatus for down-converting an electromagnetic signal, comprising:

a first and second capacitor each having a first and second port;

a ~~switching device~~ transistor having a ~~first, second, and third port~~ source, gate and drain; and

a resonant structure having a first and second port,

wherein the first port of the first capacitor and the second port of the second capacitor are ~~is~~ electrically coupled to one of the ~~second port~~ source or drain of the ~~switching device~~ transistor, and the first port of the second capacitor and the first port of the resonant structure are ~~is~~ electrically coupled to the ~~first port~~ other of the source or drain of the ~~switching device~~ transistor, ~~the second port of the second capacitor is electrically coupled to the second port of the switching device, and the first port of the resonant structure is electrically coupled to the first port of the switching device, and~~

wherein a control signal is electrically coupled to the ~~third port~~ gate of the ~~switching device~~ transistor, and an RF source signal is electrically coupled to the first port of the resonant structure, and

wherein a signal frequency at the first port of the first capacitor is lower than a frequency of the RF source signal.

87. (Currently Amended) The apparatus of claim 86, wherein a value of capacitance for the first capacitor is selected so that the capacitor discharges stored energy to a load when the ~~switching device~~ transistor is open.

88. (Currently Amended) The apparatus of claim 86, wherein a value of capacitance (C_s) for the first capacitor is selected based on a frequency (*freqLO*) of energy transfer pulses, a duration (*Aperture_Width*) of an aperture of the ~~switching device~~ transistor, and a resistance (R) such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture\_Width}{-\ln(0.841) \cdot R} \right).$$

89. (Currently Amended) The apparatus of claim 86, wherein a duration of an aperture of pulses of the control signal is nominally equal to one-half of a period of the ~~electromagnetic signal~~ RF source signal.

90. (Previously Presented) The apparatus of claim 86, wherein the first port of the first capacitor is electrically coupled to an impedance matching network.

91. (Previously Presented) The apparatus of claim 86, wherein the first port of the first capacitor is electrically coupled to an amplifier.

92. (Previously Presented) The apparatus of claim 86, wherein the first port of the resonant structure is electrically coupled to an impedance matching network.

93. (Cancelled)

94. (Currently Amended) The apparatus of claim 86, wherein the ~~switching device~~ transistor is a FET.

95. (Currently Amended) The apparatus of claim 86, wherein the ~~switching device~~ transistor is a JFET.

96. (Currently Amended) The apparatus of claim 86, wherein the ~~switching device~~ transistor is a MOSFET.

97. (Currently Amended) An apparatus for down-converting an electromagnetic signal, comprising:

a capacitor having a first and second port; and

a first and second ~~switching device~~ transistor each having a ~~first, second, and third port~~ gate, drain and source,

wherein the first port of the capacitor is electrically coupled to one of the ~~second port~~ drain or source of the first ~~switching device~~ transistor and the second port of the capacitor is electrically coupled to one of the ~~second port~~ drain or source of the second transistor ~~switching device~~, and the ~~third port~~ gate of the first ~~switching device~~ transistor is electrically coupled to the ~~third port~~ gate of the second ~~switching device~~ transistor, ~~and~~

wherein a control signal is electrically coupled to the ~~third port~~ gate of the first ~~switching device~~ transistor and the ~~third port~~ gate of the second ~~switching device~~ transistor, and an RF source signal is electrically coupled to the other of the drain or source ~~first port~~ of the first ~~switching device~~ transistor and the other of the drain or source ~~first port~~ of the second ~~switching device~~ transistor, and

wherein a signal frequency at the first port of the capacitor is lower than a frequency of the RF source signal.

98. (Currently Amended) The apparatus of claim 97, further comprising:

a resonant structure having a first and second port,

wherein the first port of the resonant structure is electrically coupled to the ~~first port~~ other of the drain or source of the first ~~switching device~~ transistor, and the second port of the resonant structure is coupled to the ~~first port~~ other of the drain or source of the second ~~switching device~~ transistor.

99. (Previously Presented) The apparatus of claim 98, further comprising:

a first and second impedance each having a first and second port,

wherein the first port of the first impedance is electrically coupled to the first port of the resonant structure and the first port of the second impedance is electrically coupled to the second port of the resonant structure, and

wherein the RF source signal is electrically coupled to the second port of the first impedance and the second port of the second impedance.

100. (Currently Amended) The apparatus of claim 97, wherein a value of capacitance for the capacitor is selected so that the capacitor discharges stored energy to a load when one of the ~~switching device~~ first and second transistors is open.

101. (Currently Amended) The apparatus of claim 97, wherein a value of capacitance (C_s) for the capacitor is selected based on a frequency (*freqLO*) of energy transfer pulses, a duration (*Aperture_Width*) of an aperture of the first and second ~~switching device~~ transistors, and a resistance (R) such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture\_Width}{-\ln(0.841) \cdot R} \right).$$

102. (Currently Amended) The apparatus of claim 97, wherein a duration of an aperture of pulses of the control signal is nominally equal to one-half of a period of the ~~electromagnetic signal~~ RF source signal.

103. (Previously Presented) The apparatus of claim 97, wherein the first port of the capacitor is electrically coupled to an amplifier.

104. (Previously Presented) The apparatus of claim 97, wherein the first and second ports of the capacitor are electrically coupled to first and second ports of a differential amplifier.

105. (Cancelled)

106. (Currently Amended) The apparatus of claim 97, wherein the first and second ~~switching devices~~ transistors are FETs.

107. (Currently Amended) The apparatus of claim 97, wherein the first and second ~~switching devices~~ transistors are JFETs.

108. (Currently Amended) The apparatus of claim 97, wherein the first and second ~~switching devices~~ transistors are MOSFETs.

109. (Currently Amended) An apparatus for down-converting an electromagnetic signal, comprising:

a first and second capacitor each having a first and second port;

a ~~switching device~~ transistor having a ~~first, second, and third port~~ gate, drain and source; and

a load,

wherein the first port of the first capacitor and the first port of the second capacitor are ~~is~~ electrically coupled to one of the ~~second port~~ drain or source of the ~~switching device~~ transistor, ~~the first port of the second capacitor is electrically coupled to the first port of the switching device,~~ the load and the second port of the second capacitor are ~~is~~ electrically coupled to the ~~second port~~ other of the drain or source of the ~~switching device~~ transistor, ~~and the second port of the second capacitor is electrically coupled to the second port of the switching device, and~~

wherein a control signal is electrically coupled to the ~~third port~~ gate of the ~~switching device~~ transistor, and an RF source signal is electrically coupled to the first port of the ~~switching device~~ transistor, and

wherein a signal frequency at the first port of the first capacitor is lower than a frequency of the RF source signal.

110. (Currently Amended) The apparatus of claim 109, wherein a value of capacitance for the first capacitor is selected so that the capacitor discharges stored energy to a load when the ~~switching device~~ transistor is open.

111. (Currently Amended) The apparatus of claim 109, wherein a value of capacitance (C_s) for the first capacitor is selected based on a frequency (*freqLO*)

of energy transfer pulses, a duration (*Aperture_Width*) of an aperture of the ~~switching device~~ transistor, and a resistance (R) such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture\_Width}{-\ln(0.841) \cdot R} \right).$$

112. (Currently Amended) The apparatus of claim 109, wherein a duration of an aperture of the ~~switching device~~ transistor is nominally equal to one-half of a period of the ~~electromagnetic signal~~ RF source signal.

113. (Previously Presented) The apparatus of claim 109, wherein the first port of the first capacitor is electrically coupled to an impedance matching network.

114. (Previously Presented) The apparatus of claim 109, wherein the first port of the first capacitor is electrically coupled to an amplifier.

115. (Previously Presented) The apparatus of claim 109, wherein the first port of the second capacitor is electrically coupled to an impedance matching network.

116. (Cancelled)

117. (Currently Amended) The apparatus of claim 109, wherein the ~~switching device~~ transistor is a FET.

118. (Currently Amended) The apparatus of claim 109, wherein the ~~switching device~~ transistor is a JFET.

119. (Currently Amended) The apparatus of claim 109, wherein the ~~switching device~~ transistor is a MOSFET.